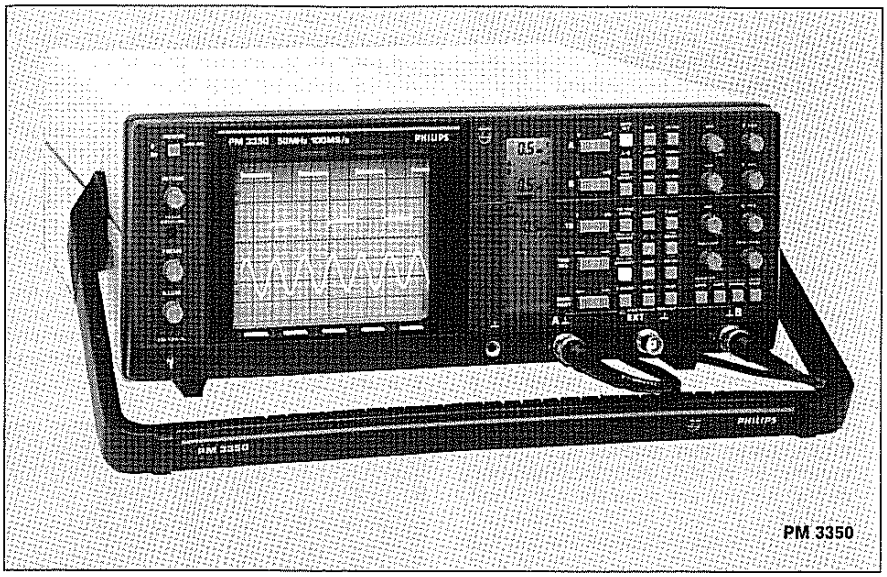
# PM 3350

GPIB IEEE-488

RS-232

NEW




## PM 3350 100 Ms/s Advanced Digital Storage Oscilloscope

- 100 Ms/s sample rate on each channel
- Synchronous sampling on both channels
- 50 MHz analog bandwidth
- Operates as an analog oscilloscope or as fast Digital Storage Scope
- Triggering up to 100 MHz
- Autoset for instant on-screen trace display in both operating modes
- Cursors for measuring dV, dt and automatic rise/fall time, frequency and amplitude
- IEEE-488 and RS 232 interface options
- Analog and digital plot capabilities

### Analog and Digital

The PM 3350 is the answer to many DSO measurement requirements, offering a combination of the best of real-time and digital storage oscilloscope technology.

PM 3350 is designed as a high power digital storage scope for capture and analysis of single events and repetitive signals. It also has real-time capabilities that are needed or convenient in some applications.

The PM 3350 is not simply an analog scope with add-on digital features but is a fully implemented DSO with real-time capability. The PM 3350 storage benchmark is a very high maximum 100 MSamples/s sampling rate for each channel simultaneously. This very high sampling frequency offers the capability of storing fast signals with excellent resolution. The maximum single event resolution is 10 ns.

### Analog Shift Register

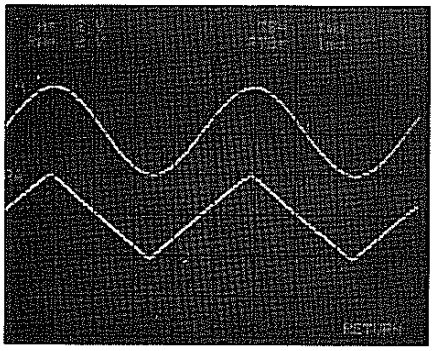
PM 3350 uses a P2CCD (or profiled peristaltic charge coupled device), a solid state combination of a fast track-and-hold input circuit and an analog shift register. Momentary values of input signals in analog samples are captured with intervals as short as 10 ns (100 Megasamples/second clock). After triggering these samples are presented to an accurate, successive approximation ADC at a much slower 100 kilosamples/second. Digitizing is thus internally a low frequency operation, giving high resolution, yet not sacrificing the very high data capture rate of 100 Megasamples/sec.

This means that single shot events can be captured and displayed up to a capture bandwidth of over 20 MHz, such as in destructive testing or power device switching transients. Indeed, the fast sample rate of the PM 3350 brings an unparalled break-through in DSO performance in this price range.

### Deep Memory

At lower timebase speeds up to 5 ms/div signals are stored in a 4k x 8-bit memory. Data from the memory can be transferred to a second 4k x 8-bit memory by one keystroke, permitting separate storage of channels A and/or B.

This allows storage and display of reference waveforms while at the same time capturing and displaying live signals from the device under test. Up to 4 traces may be stored and displayed at any one time.



*The PM 3350 has the ability to store waveforms in an "R" memory (Reference) for waveform comparisons. A total of four waveforms can be displayed at any one time.*
*In this picture, a waveform stored from the A Channel is being compared with a waveform earlier stored in the RA memory.*
*Note that the waveforms are labeled to show their origin, and that the amplitude and time base settings for each register are displayed in the top linees of the screen.*

### Low Frequency Signal Registration

As well as fast signal capture the PM 3350 has a 50 s/div. facility giving a visual display lasting 8 minutes, allowing low frequency phenomena to be studied. The signal can be frozen at any time within a single button.

This feature is useful for study of chemical or biological reactions and responses for example, or for slow mechanical wear and tear cycling. In fact the roll facility as it is known, is used in a similar way to a paper and pen recorder.

### Triggering Functions

The PM 3350 has a selection of powerful trigger capabilities, including Automatic, Manual and Single shot settings. In addition the micro-computer control delivers built-in intelligence that completely eliminates operator adjustment in auto-triggering mode, making operation simpler and more accurate. TV line and frame for positive and negative video, alternate, auto P-P or DC, ext. and line trigger are all included in the triggering facilities, which has a wide 100 MHz bandwidth.

# Digital Storage Oscilloscope

## PM 3350

### Pretrigger and Post Trigger Delay Capabilities

A major advantage of a digital storage scope is its ability to precisely define the portion of the waveform to be captured before or after the trigger. The PM 3350 has a pre-trigger capability of up to 10 divisions. This means that events leading up to the trigger moment may be captured and viewed. For example in transient waveforms the whole of the leading edge may be recorded rather than just from the trigger moment on. Further for post-trigger, i.e. the time delay after the trigger point, the PM 3350 has a capability of up to 250 divisions. That means that records of over 25 screens worth of information can be capttured and displayed.

### Low Level Signals

In mechanical application where very low level signals are usual, the 2 mV/div. input allows direct input of, for example, a transducer inputs to the memory.

### X-Y Displays

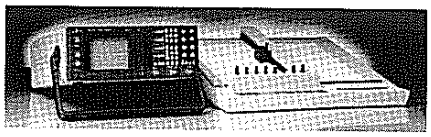
The analog mode can be used for the display of X Y diagrams. Filter curves, lissajous figures and other similar phenomena which are not time-related, but have other reference voltages can be displayed for further analysis.

### IEEE-488 or RS 232 C Interface

Signal transfers between the PM 3350 and a controller are possible via IEEE-488 or RS 232 C interfaces, for data processing, digital plot and mass storage.

### Documentation and Hard Copies.

The PM 3350 provides the user with several options to document waveforms on hard copies. Every PM 3350 comes with an analog output to drive an X Y recorder. A pen lift control is also provided. Digital plotters can be driven directly from the optional IEEE-488 or RS 232 ports. The Philips PM 8155 and HPGL compatible plotters are supported by the PM 3350. Furthermore, the RS 232 port is directly compatible with certain types of dot-matrix printers, such as the Epson FX 80 and compatibles.



*The PM 3350 can directly drive plotters thru the IEEE-488 or RS 232 interfaces.*
*Hard copies can also be made using standard dot-matrix printers.*

### Ergonomic Design

Much attention has been paid to the operator interface on the PM 3350. All the innovations on the Philips 60 MHz and 100 MHz oscilloscopes are utilized in the PM 3350, resulting in a front panel layout that is much clearer, simpler and easier to use than on conventional scopes. Significant and new features are:

- LCD panel for direct read-out.
  The LCD panel right next to the screen gives a clear, at-a-glance alphanumeric read-out of settings eliminating the need to look at control positions set on a crowded textplate.
- Fast-action up/down controls.
  Ranges and settings are entered by fast, fingertip-action controls.
- Menu-driven softkeys.
  Functions such as time base and trigger settings are softkeyed, with a step-through function sequence. Selected functions are clearly indicated at all times on the LCD panel.
- Logical panel layout.
  Variable settings like Y-pos. and X-pos. trigger levels and hold-off are grouped together on the right of the front panel and display settings are grouped on the left of the CRT.

The result is a clear panel layout that simplifies and speeds operation.

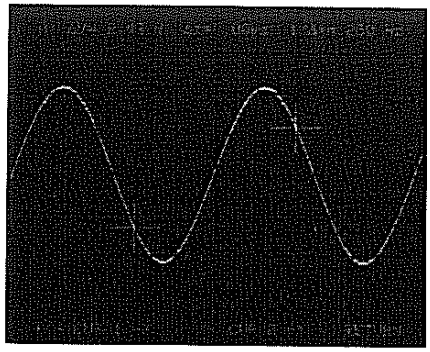
### AUTOSET

This function, accessed by a single button, allows instant setting of all scope parameters for any input signal, eliminating time-consuming manual range finding and fine adjustment. AUTOSET operates in the Digital Storage mode, as well as when operating in the Real Time mode. Combined with the ergonomic design, PM 3350 really offers true ease of use.

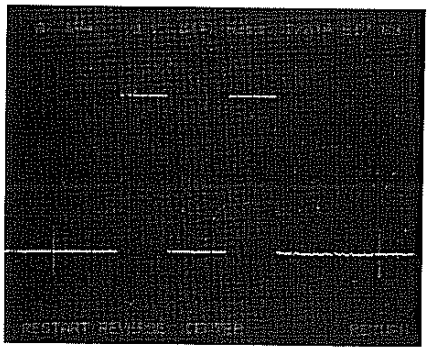
### Signal Handling

The PM 3350 features extensive signal handling and measurement capabilities. It has clear on-screen softkey menu structures that permit quick access to a wide variety of measurements by means of two independent cursors. These cursors allow the usual dV (difference voltage between cursors) and dt (difference time between cursors) to be performed, and further extend the range of automatic measurement facilities. In addition, the cursors offer measurements of signal frequency, rise and fall times and voltage peak-to-peak of the captured waveform and can be performed live.

Other signal handling capabilities include a unique function called RESTART. This function allows the user to zero in on a specific part of the signal, simply by positioning the cursors either side of the portion of the waveform of interest and pressing the RESTART key. The result is the reacquisition of the signal at full resolution (not just expansion which yields no further signal information), with a digital delay and timebase calculated from the position of the cursors. To complement the signal handling there is a further signal expansion possibility up to a factor 32.



*The PM 3350's cursors provide direct readouts of amplitude and time values. A 1/T feature provides handy frequency readouts. Cursors can be used on either channel, on either register.*

*The RESTART feature at work:*
*Place the cursors over the area of interest, touch "RESTART" and the PM 3350 automatically calculates proper delay, and time base settings to capture any signal detail that has been selected by the user.*

### Modular Design, Easy Service

The modular design and construction of the PM 3350 DSO provides exceptional component accessibility, making service fast, simple and low-cost. Swing-up PCBs allow easy access and removal is straightforward due to the plug-in flat ribbon cable connections.

Repairs in the field are quickly performed by simply replacing damaged modules. A complete, built-in software-driven test routine

assures correct operation within minutes via on-screen test displays with instruction text.

### Automatic Testing

The modular construction brings another benefit - thorough testing, at module level for the first time, before building into a complete instrument. Each module passes through a computerized test station where it is given a complete functional test and adjustments are made. There is thus no chance of a complete instrument containing a faulty module.

As a check, complete instruments have to pass a test routine, an extended burn-in period and then, a final series of test. Thus, through such a rigorous test procedure, last minute defects are eliminated ensuring a long, trouble-free service life for the instrument.

## Specifications

## Technical Specifications

### Analog Mode

**Vertical**
**Display Modes:** YA, YB, INVERT, A + B, A - B
**Frequency Response:** DC...>50 MHz -3 dB (20 mV/div...10 V/div)
DC...>35 MHz -3 dB (2 mV/div...10 mV/div)
In AC mode, lower -3 dB point is <10 Hz
**Risetime:** <7 nS (20 mV/div...10 V/div)
<10 nS (2 mV/div...10 mV/div)
**Max. Pulse Aberrations:** <1.5 sub. div. peak-to-peak (input pulse 5 div. risetime 1 ns)
**Deflection Co-efficient:** 2 mV/div...10 V/div in steps of 1,2,5 sequence
**Error Limit:** 3%
Continuous control between steps with > flashing in LCD as warning symbol for uncal. amplitude setting
**Input Impedance:** 1 MΩ ±2%//20 pF ±2 pF
**Max. Rated Input Voltage:** 400V (DC + AC peak)
**Dynamic Range:** >24 div. at 10 MHz
>8 div. at 50 MHz
**CMRR 100:** 1 at 1 MHz

**Horizontal**
**Display Modes:** Timebase, or X Y displays using YA and/or YB (Vertical) and YA, YB or Ext (Horizontal)

**Timebase (TB)**
**Time Co-efficient:** 0.5 s/div - 50 ns/div in steps of 1,2,5 sequence
**Expansion:** x10
Fastest sweep speed is 5 ns/div.
**Error Limit:** 3%
**Error Limit Total Incl. x10 Magn.:** 4%
Continuous control between steps with > flashing in LCD as warning symbol for uncal. Sweep setting. Hold-off continuously adjustable up to 10x min. value.

**Triggering**
**Trig. Modes:** Auto (free run), Non Auto Triggered, Single
**Trig. Source:** A, B, Composite (A,B), Ext. (DC or AC), Line LCD indicates Not triggered, Triggered or Armed status
**Trig. Coupling:** Auto Peak-to-peak (P-P), DC, TVL, TVF
**Trig. Sensitivity**

| | Int. | Ext. |
|---|---|---|
| 10 MHz | 0,5 div. | 50 mV |
| 50 MHz | 1 div | 150 mV |
| 100 MHz | 2 div | 500 mV |
| TVF/TVL | 0.7 div sync. | 70 mV sync. |
| Level range | ±8 div. | ±800 mV |

Slope positive, or negative , TVF or TVL pos. (+) or neg. (-).

**X-Deflection**
**Deflection Co-efficient:** via channel A or B 2 mV/div...10 V/div
via Ext. input 100 mV/div
**Freq. Response:** DC...2 MHz
**Error Limit:** 5%
**Phase Shift:** <3° (at 100 KHz)
**Ext. Input:** 1 MΩ + 2%//20 pF + 2 pF
**Max. Input Voltage:** 400V (DC + AC peak)

### Digital Mode

All specifications equal to specifications of analog part except where stated.
**Vertical**
**Resolution:** 8 bits.
**Display Modes:** YA, YB, Invert
**Frequency Response:** DC...>20 MHz -3 dB (2 mV/div...10 V/div)

**Horizontal**
**Display Modes:** Recurrent, Single shot, Multiple shot (up to 2) and Roll (stopped by trigger).

**Timebase**
Recurrent, single shot, multiple shot 0.5 s/div - 0.5 /us/div
**Roll:** 50 s/div - 1 s/div
**Timing Accuracy:** 0.2%

**Horizontal Resolution**
**Single Channel Acquisition:**
5 ms/div...50 s/div; 4096 samples
0.5 /us/div...2 ms/div; 512 samples
**Dual Channel Acquisition:**
5 ms/div...50 s/div; 2048 samples
0.5 /us/div...2 ms/div; 512 samples

**Signal Acquisition**
**Sampling:** 0.5 /us/div...50 s/div
**Maximum Sampling Rate:** Up to 100 Msamples/s, synchronously for both channels
**Trigger Delay:** -10...+250 divisions, adjustable
**Display Expansion:** x1...x32 horizontal

**Memory**
**Registers:** 2
**Depth of Acquistion Register:** 4096 words
**Vertical Resolution:** 8 bits

**Cursors**
Horizontal resolution in single channel mode: 1:4096;
in dual channel mode: 1:2048
At 2 ms/div...0.5 us/div: 1:512
**Vertical Resolution:** 1:256
**Read Out Resolution:** 3 digits
**Voltage Cursors:** Error limit ±2% (ambient temperature 15...35°C)
**Calculation Functions:** peak to peak value, rise or fall time, frequency, dt, dV, 1/dt

**Analog Output for X Y Recorders**
**Output Level:** 1V/full memory ±2%
**Penlift:** TTL compatible (0 or 1)
**Plot Time per Sample:** 20 ms...2000 ms
**Connector:** DIN 9 pin female
**Functions:** Memory dump, register selectable
**Output Sequence:** Channel A first

### IEEE 488

**Bus Driver:** E2 (Three state)
**Interface Function Repertoire**

| | | |
|---|---|---|
| | Source handshake | Complete capability |
| AH1 | Acceptor handshake | Complete capability |
| T5 | Talker functions | Basic talker, Serial poll, Talk only, unaddress if MLA |
| L3 | Listener functions | Basic listener, Listen only, unaddress if MLA |
| SR1 | Service request | Complete capability |
| RL2 | Remote/Local | No local lockout |
| PP0 | Parallel poll | No capability |
| DT1 | Device trigger | Complete capability |
| DC1 | Device clear | Complete capability |
| C0 | Controller | No capability |

### RS 232

**Handshake:** Software XON/XOFF
Hardware DSR/DTR and CTS/DTR
**Baud Rate:** Transmit 75...19,200
Receive 75...1,200
**Stop Bits:** 1 or 2
**Parity:** Odd, even or no
**Character Length:** 7 or 8

**Digital Plot Capabilities**
**Language:** HPGL or Philips protocol depending on plotter type selected
**Plotter Select:** Philips PM 8153/1, PM 8153/6, PM 8154, PM 8155 HP 7450, HP 7475 A
**Pen Select:** Pen 1 for Ch A
Pen 2 for Ch B
Pen 3 for Register Ch A
Pen 4 for Register Ch B
Pen 5 for graticule and alphanumerics
**Plot Area:** Software selectable

**Dot Matrix Printer Capabilities**
Compatible with Epson FX 80 or compatible dot matrix printers.
**Drawing Area:** 10 x 10 cm

## General Specifications

### Miscellaneous

**Display:** CRT with 8 x 10 cm viewing area P31 phosphor, 16 kV acceleration voltage. Parallax-free graticule with continuously variable illumination
Separate LCD for display for menus, settings, status indications etc.

# PM 3350

LCD is constantly illuminated by backlighting. Autoset selects proper channel(s), sets vertical defection, timebase speeds and triggering for easy-to-read display of input signals

**Power Supply**
**Line Voltage Range:** 100V...240 VAC ±10%
**Line Frequencies:** 50 Hz...400 Hz ±10%
**Power Consumption:** 70W

**Mechanical Data**
**Width:** 387 mm (15.2 in.) incl. handle
350 mm (13.8 in.) excl. handle
**Length:** 530.5 mm (20.9 inc.) incl. handle and knobs
518 mm (20.4 in.) incl. handle excl. knobs
455.5 mm (17.9 in.) excl. handle incl. knobs
433.5 mm (17.1 in.) excl. handle and knobs
**Height:** 146,5 mm (5.8in.) incl. feet
134.5 mm (5.3 in.) excl. feet
132.5 mm (5.2 in.) excl. lower cabinet
**Weight:** Approx. 9.5 kg (20.9 lb) excl. access

**Environmental Data**
**Temperature Rated Range of Use:**
10°C...40°C
**Limited Range of Operation:** 0°C...50°C
**Storage:** -40°C...+75°C
**Altitude**
**Operating:** 4,500m (15,000 ft)
**Transport:** 12,000m (40,000 ft)
**EMI:** Meets requirements of MIL-STD-461 Class B, VDE 6871 and VDE 0875 Grenzwert-klasse B

## Ordering Information

### Models

**PM 3350** Standard model
**PM 3352** Rackmountable model

### Options

**/40** Incl. IEEE-488 interface
**/50** Incl. RS 232 interface
Both interface options include digital plot-out with HPGL and Philips protocols.

### Interfaces

**PM 8957** IEEE-488
**PM 8958** RS 232

Power Options (See page vii)